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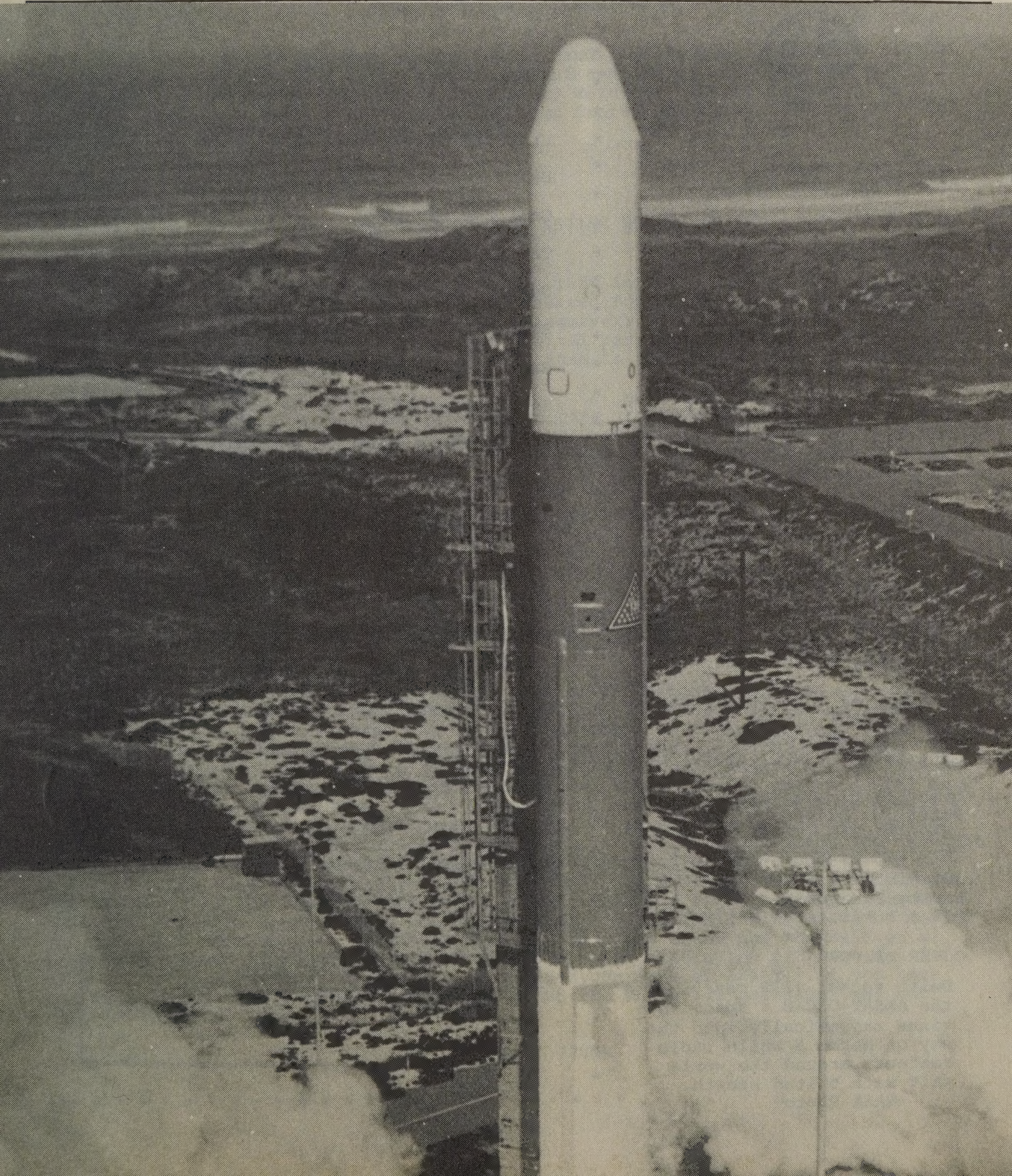

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* * *

COVER PICTURE

Delta rocket #139 carrying the AMSAT-OSCAR 8 spacecraft rises majestically into the sky on March 5 while radio amateurs around the world wait with baited breath.
-NASA Photo-

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FROM THE EDITOR

AN APOLOGY

The Area Coordinator Update in the December Newsletter showed that K6PGX was appointed as an Area Coordinator for California. Unfortunately, this was interpreted to mean that K6PGX was replacing W6CG. This was not and is not the intent of that announcement. W6CG is doing a good job and by virtue of his efforts has generated more than enough work for himself. Thus, K6PGX is serving as an additional Area Coordinator for California. As Editor of the AMSAT Newsletter, I take the responsibility and blame for the error.

AMSAT-OSCAR 8 INFORMATION

The American Radio Relay League is now handling the distribution of all QSL cards, report forms, publicity, photos and information on the new AMSAT-OSCAR 8 spacecraft. Write ARRL OSCAR Operations, 225 Main St., Newington, Conn. 06111 U.S.A., telephone (203) 666-1541. AMSAT Area Coordinators may also contact ARRL directly for AMSAT supplies and materials.

AMSAT-OSCAR 8 OPERATING NOTES

Current plans are to operate the spacecraft in Mode A during the week and Mode J during weekends. Wednesdays are reserved for pre-arranged experiments only, with scheduling handled by Bernie Glassmeyer, W9KDR at ARRL Hdq. It will take a few weeks to determine more exact orbital parameters of the spacecraft. Thus, all data published to date including that in this newsletter should be regarded as provisional.

Stay tuned to the AMSAT Nets for up-to-date information. We expect that AMSAT will publish an orbital calendar on AMSAT-OSCAR 8 to be available through Skip Reymann, W6PAJ around the end of May (see the anouncement on page 23).

PHASE III COMMUNICATIONS CHANNELS

When the first Phase III spacecraft becomes operational, a whole new world will open up to radio amateurs. For the first time, reliable communication paths will be open for point-to-point and multi-point contacts. Conventional contacts are subject to on-channel and adjacent-channel spill-over interference. The advantages of using the Phase III satellite for "nets" or "roundtables" will soon be noticed by the users, and it is expected that these types of contacts will form a common use of the satellite. One possibility might be to reserve four specific channels for SSB net use. These channels could be at the top of the SSB section of the downlink passband and spaced 5 KHz apart. Thus, stations using the channels (A, B, C, and D where A is the highest frequency channel)would be guaranteed QRM-free links (no adjacent spill-over and no on-channel) for network communications. The remainder of the SSB passband would be available for regular random frequency contacts. Channel A could also be used as a calling channel, with stations moving off frequency once contact is established. Nets would share the channels on a time of day basis, similar to current HF usage. The allocation of times and channels to nets would be handled by the operations side of AMSAT. If you have any comments on the reservation of channels on the Phase III passband, why not write in and share them.

Joe, G3ZCZ

MODIFICATION OF THE SATELLABE III FOR USE WITH OSCAR-8

BY KAZ DESKUR, K2ZRO

The original Satellabe[1] was designed for AMSAT-OSCAR 6 and 7 and is not directly applicable for AMSAT-OSCAR-8. The device can, however, be easily modified for A-O-8 or any other satellite traveling in a virtually circular orbit by following the instructions in this article.

Although only pre-launch orbital parameters of A-O-8 were known when this was written, the expected deviation from the predicted orbit is most likely to be so slight that the accuracy of the Satellabe should not be affected to any appreciable degree. The modification of the Satellabe is a project lasting no more than one hour.

The parameters used are:

PERIOD - 102.76 min.
INCLINATION - 99 degrees
ALTITUDE (average) - 872 km; 542 miles

MODIFICATIONS

1. Scale #1, "THE MAP", and Scale #2, "THE EQUATORIAL CROSSING TIME", need no changes. They are applicable for any satellite.

2. Scale #3, "INDEX SCALE", must be modified to represent equatorial progression of (P/4) degrees which for OSCAR 8 is 102.76/4 ≈ 25.7 degrees.

Procedure:

Line up 0 degrees longitude on the equator of the map against No. 1 index mark of Scale#3 as shown on Fig. 1. Draw a new set of index marks separated 25.7 degrees apart. (For this purpose, use Table I.) Since Scale#3 is dark, it is recommended that you use a light background. Self adhesive circles work very well.

TABLE 1

INDEX#	DEGREES	INDEX#	DEGREES
1	0.0	9	205.6
2	25.7	10	231.3
3	51.4	11	257.0
4	777.1	12	282.7
5	102.8	13	308.4
6	128.5	14	334.1
7	154.2	15	359.8
8	179.9		

3. Scale #4, "PRECISION TIME SCALE", will not be used. (Precise period must be known to make this scale accurate).

4. The new earth track will be superimposed on the existing transparent slider.

Procedure:

Line up the reference line of the "old" OSCAR 7 track against 340 degrees longitude on the equator. (See Fig. 2) Starting at 0 degrees longitude and 0 degrees latitude, "eyeball" the positions of the time marks on Fig. 2 and duplicate them on the slider. Make sure that the slider doesn't move during this operation. Time marks are spaced at 2 min. intervals. If more accuracy is desired, use Table II.

---

[1] "Shoot OSCAR with a Satellabe", by Kaz Deskur, 73 Magazine, July 1975, pp.33-44 (reprinted in AMSAT Newsletter, March 1976.) The Satellabe III is available assembled from Ham Radio, Greenville, N.H. 03048 for $7.95 postpaid.

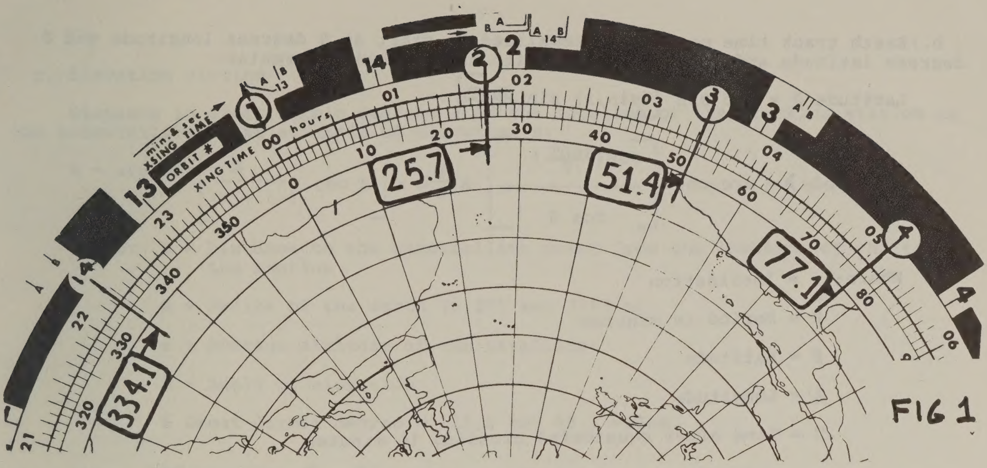


FIG 1

Add the reference line extending the 0 degrees meridian about 1/8 inch into the index scale.

Probably the best pen for this job is a popular marking pen sold in most art stores under the brand name of "SHARPIE", manufactured by Sanford's. It won't rub off, is very water-resistant, but it can be removed very easily with nail polish remover.

TABLE II

Time After EQX	LAT.	LONG.	Time After EQX	LAT.	LONG.
0	0	0	26	81.0	102.1
2	6.3	1.6	28	78.1	138.6
4	13.8	3.3	30	72.7	157.0
6	20.7	4.9	32	66.5	169.0
8	27.6	6.7	34	59.9	172.6
10	34.5	8.5	36	53.2	176.7
12	41.3	11.3	38	46.4	179.7
14	48.1	13.8	40	39.6	182.5
16	54.9	17.0	42	32.7	184.4
18	61.6	21.3	44	25.9	186.8
20	68.1	28.0	46	19.0	188.5
22	74.1	39.6	48	12.1	190.2
24	79.1	61.7	50	5.2	191.8
			52	-1.7	193.4

5. Azimuth-Elevation Overlay

The existing overlay can be used unmodified with the following exception: The elevation range must be read 10 DEGREES LOWER. Namely, the 10 degree range of OSCAR 7 will become 0 degrees elevation (limit of accessibility) of A-O-D; 20 degrees on the existing overlay will correspond to 10 degrees; 30 degrees will equal 20 degrees; etc. (See Fig.3).

Using this procedure, the error will be no greater than 1.6 degrees which is a lot less than most antenna rotators can resolve. The maximum error is at 0 degrees angle (1.6 degrees) which causes the circle of accessibility of A-O-D to be 110 miles (178 km) further out than the 10 degree circle on the existing overlay. (This corresponds to about two thicknesses of the line.)

6. To adapt the Satellabe for other satellites, use the following formulas:

a.) Equatorial progression:

Separation between index marks = P/4 degrees

Where P=Period of the satellite in minutes.

b.) Earth track time marks are normalized to start at 0 degrees longitude and 0 degrees latitude and are calculated with the following formulas:

$$\text{Latitude } \varnothing = \text{arc sin} \left[(\sin i) \sin \frac{360T}{P} \right]$$

$$\text{Longitude } \lambda = \text{arc cos} \left[\frac{\cos(\frac{360T}{P})}{\cos \varnothing} \right] \times \frac{T}{4}$$

Where: i = Inclination

P = Period in minutes

$\varnothing$ = Latitude

λ = Longitude

T = Time after equatorial crossing in minutes

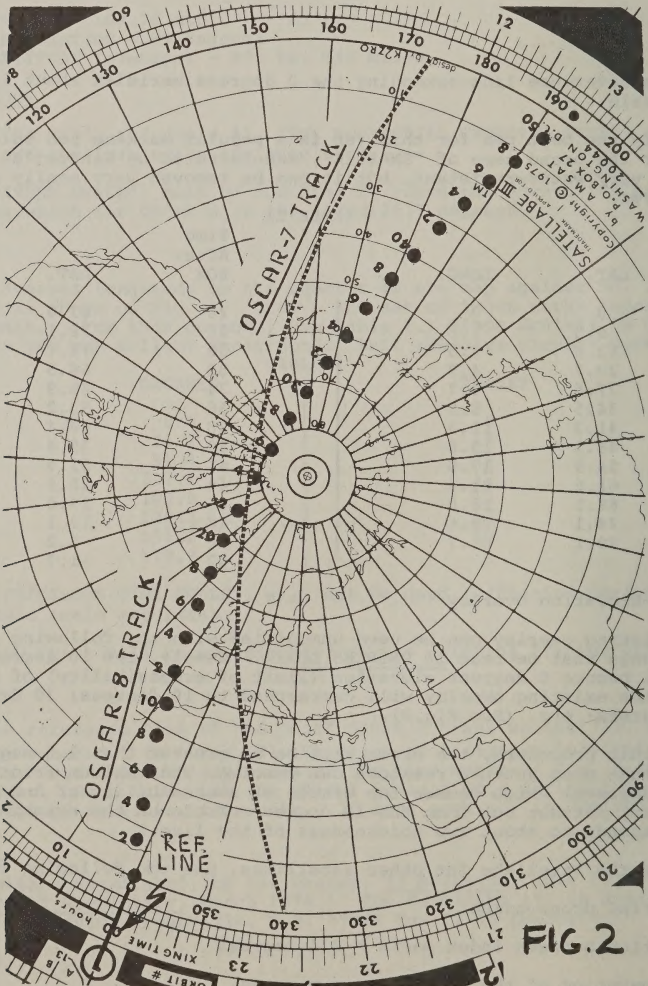


FIG. 2

c.) Elevation circles

Distance in great circle degrees from the location of the tracking station to the subsatellite point at angle of elevation E:

$$B = \arccos\left[\frac{R}{(R + h)} \cos E\right] - E$$

Where: B = Distance to the subsatellite point from the location of the tracking station

R = Radius of the earth (6,371 km; 3960 m)

r = Average altitude of the satellite

E = Angle of elevation

1 Great Circle degree = 111.2 km; 69.1 miles

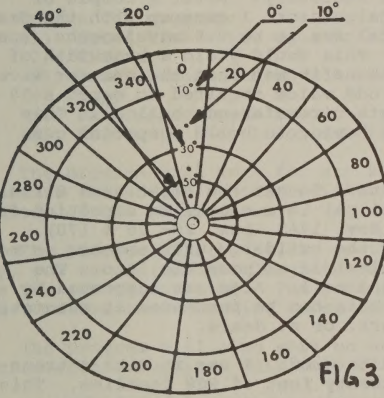


FIG3

CALL FOR PAPERS

Amateur Computing 78 Microcomputer Festival will be held July 22-23 at the Sheraton National Motor Hotel, Arlington, Virginia. Those interested in presenting a paper, participating in a panel discussion, displaying an amateur computer system or sponsoring a tutorial should submit a letter of intent along with a one page abstract or outline by April 15 to John Wall Miller, Program Chairman, 6921 Pacific Lane, Annandale, VA. 22003, telephone (703) 256-5702. Authors will be provided with instructions for preparation of camera-ready papers which are due by June 1.

Especially welcome will be topics concerning amateur radio (satellite) applications of microcomputers.

Information on Amateur Computing 78 may be obtained by writing AMRAD, Box 682, McLean, VA. 22101 or by telephoning John Wall Miller (703) 256-5702.

The 1978 ARRL Technical Symposium will be held on Saturday, September 16, 1978 at the Tysons Corner Ramada Inn, Falls Church, Virginia in conjunction with the National Capital DX Association's DXPO 78. This American Radio Relay League technical symposium is managed by the Amateur Radio Research and Development Corporation (AMRAD) and sponsored by the Northern Virginia Amateur Radio Council (NOVARC).

Previously unpublished papers are invited on all technical subjects relating to amateur radio. Prospective contributors are asked to forward informal summaries along with a photo of the author and a one-page bio sketch of the author's amateur/electronic background by July 15. Manuscripts are due by August 15. Please write or call: Paul Rinaldo, W4RI, 1524 Springvale Ave., McLean, VA. 22101, (703) 356-8918 evenings or weekends.

THE TAILORED HELICAL

By Domenic M. Mallozzi, N1DM
196 Gray Street
Providence, R.I. 02909

When the author was looking for a new antenna to replace his old one, (A dipole over a reflector) for Mode B uplink, the helical came to mind. The author had four basic requirements for his new antenna:

1) Wide beamwidth (greater than 50 degrees)
2) Gain of 6 to 9 dbi
3) Non-critical construction and matching
4) Wide bandwidth - for use in 432 transmitting and 435 reception with no significant decrease in performance

The wide beamwidth was required so no rotor was necessary for approximately 8 to 10 minutes of useful signal per orbit. The only aiming required is to point the antenna at the correct elevation for the pass. Because the available amateur books and magazines showed no such helical, I turned to Kraus' Antennas (McGraw-Hill; New York; 1950). Chapter 7 of this book could be called the Helical Bible. The author was particularly intrigued by Fig. 7-33 (p. 211) which shows the effect of circumference on polar radiation patterns and table 702 (p. 213) which gives helical design formulas. After referring to these items, I became convinced that a circumference of less than one wavelength was necessary. After a couple of weeks of fooling around with the charts and a calculator, I came up with the design for my helical. The circumference of the helical was to be 0.8 wavelengths, spacing between turns of 0.25 wavelengths and 3 turns. This would yield a beamwidth of 75 degrees and a gain of about 8.5 dbi. An added benefit was that the quarter wave matching section required was 75 ohms, not the odd value required to match a 50 ohm line to the 140 ohm feedpoint of a one wavelength circumference helical. This means a piece of RG59 could be used rather than having to build a special coax matching section.

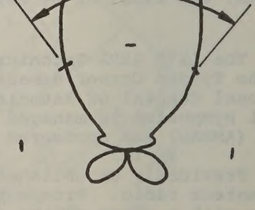
The accompanying diagram gives the dimensions. To get the Right Hand Circular Polarization needed for Mode B, you wind the helical in a clockwise direction from the feedpoint out as described by DeMaw (QST: Nov. 1965, pgs. 20- 25 & 170). As for mechanical construction, I leave that to the builder, just remember no metal inside the winding, and, in fact, as little dielectric as possible, too. The helix should, as much as possible, be an airwound coil. Also, as suggested by DeMaw, the conductor is ¼ inch copper tubing. This can be purchased at automotive parts stores, hardware stores, plumbing suppliers, or at Sears.

The author has found this antenna to be quite good. I use it with a transmitter that has 5 to 15 watts output and uses twenty feet of RG8 feedline. This results in ERP's of 35 to 100 watts. The antenna sits at ground level when in use; the only aiming being pointing it at the midpoint of azimuth and elevation for the orbit. It has a wide enough beamwidth that it gives about 10 minutes use per pass with no reorientation.

The antenna requires no precision mechanical work and therefore can be built with your normal household tools. Good luck with your tailored helical and drop me a line when you get it up to tell me how it works.

Thanks to WB1FDY and WA1NXW for help in getting materials for a prototype and to N1RI for reading the manuscript for technical clarity.

CALCULATED POLAR PATTERN



NOTES:
1) TOTAL TUBING REQ'D 60"(1.52 M)
2) CALCULATED GAIN 8.5 dbi
3) CALCULATED BEAMWIDTH (3 db) 75°
4) TO MATCH 52 Ω LINE, REQUIRES 75Ω QUARTER-WAVELENGTH TRANSFORMER

OSCAR 7 ORBITAL PREDICTIONS
BY POCKET CALCULATOR
Part II

By Bill Ralston, WA6KHB

The following program for an HP-25 hand calculator was not written as a sequel to the program described by JA2WO in the December issue of the AMSAT NEWSLETTER but is a logical progression. The program serves as a substitute for the OSCAR locator (available from AMSAT and ARRL) in calculating azimuth and range for an OSCAR pass anywhere in the world.

The program is described in Table 1. A detailed description was omitted in the interest of conserving space.

To use, the program should be keyed in, and the registers initialized to the values in Table 2. Register 0 is the longitude of the ascending node, expressed in degrees west. This value will have to be changed for every orbit. The range calculated by the program will be in the same units as register one is stored, either kilometers or miles. The value should be the radius of the satellite orbit from the center of the earth. Register 2, the inclination of the orbit should be measured as shown in Fig. 1.

To run the program:

1) Enter time after equatorial crossing
2) R/S
3) Read azimuth (north = 0, east +, west -)
4) x ⇄ y
5) Read approximate range
6) Return to step 1 for new time, or change R_0 for new pass

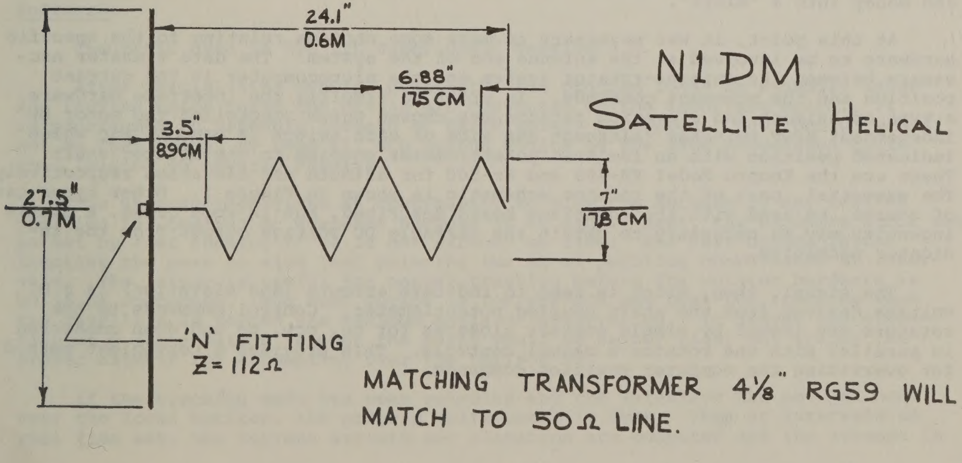
The program will work for any satellite (A-O-D, RS, Phase III) if the correct constants are stored in the registers. Southern hemisphere stations should store 90-latitude of QTH in register 4.

The program will be fairly accurate for one or two orbits, but for best accuracy, you should use the longitude and time of the ascending node of the orbital pass you are calculating. The program will also work for descending passes; remember to use the ascending node, though.

The program will also work on an HP-25C or HP-29C without change, and any HP programmable calculator with only slight modification of the program.

Best of luck using the program, and, of course, if anyone has any improvements (especially how to include an elevation calculation) I would appreciate hearing.

Bill Ralston, WA6KHB
1492 Oak Grove Circle
Santa Ana, CA 92705



A REAL TIME TRACKING SYSTEM FOR AMATEUR RADIO SATELLITE COMMUNICATION ANTENNAS

By John L. DuBois
Dytron Inc.
241 Crescent St.
Waltham, MA. 02154

Introduction:

This paper describes a hardware-software system for pointing an amateur antenna at a polar orbiting satellite such as OSCAR-7 and automatically tracking it during a pass.

The program is written in Basic and performs all computations necessary for tracking once given the pass equator crossing time and longitude.

The system described uses a S-100 bus microcomputer operating with BASIC. Specific hardware is described consisting of A/D conversion and parallel output for interface with antenna azimuth and elevation rotators. The system requires a real time clock in the computer and a commercially available S-100 buss clock board is used in the example.

Background and Objectives:

There have been a number of good articles (1,2,3) written on the subject of computing the track of low altitude polar orbiting satellites such as OSCAR-7 and NOAA-5 for amateur radio purposes. There have also been several ingenious circuits published (4,5) for pointing appropriate antennas at the satellite track from pre-programmed media such as tape cassettes or paper tape.

The obvious combination, however, in view of the current explosion of microcomputer applications between doing the track computations and managing the pointing hardware all by microcomputer has not yet, to the author's knowledge, appeared in the amateur literature. This is such an appealing application after one has experienced the need for six arms in trying to track an OSCAR pass, tune the receiver,spot it to the desired frequency with the transmitter, and log the last QSO, that it was tackled very shortly after getting up an operational microcomputer system.

A review of the literature in amateur publications quickly turned up a wealth of ideas for software. The article by Henson in February, 1977, 73 Magazine is an excellent reference and, in fact, forms the basis for most of the orbital calculations in this program.

The material available for hardware, on the other hand, is not very helpful unless one intends to exactly duplicate a particular pre-programmed "tracking" circuit. Since the effort and cost involved in building one of these devices is a significant fraction of that necessary to assemble a small microcomputer and the result is specialized to only one purpose, it seems more desirable to put the labor and money into a "micro".

At this point, it was necessary to make some choices relating to the specific hardware to be involved at the antenna end of the system. The data transfer necessary between the antenna-rotator system and the microcomputer is the current position and the movement commands. In order to simplify the interface hardware, a type of azimuth and elevation rotator was chosen which controlled the motor by independent SPST switches (although one side of each switch is common) and which indicated position with an isolated potentiometer coupled to the rotator shaft. These are the Kenpro Model KR-400 and Kr-500 for azimuth and elevation respectively. The essential part of the rotator schematic is shown in Figure 1. Other types can of course, be used with the interface board described, but in some cases, a little ingenuity may be necessary to obtain the variable DC voltage output from the indicator mechanism.

The signal, then, which is read to indicate azimuth (and elevation) is a DC voltage derived from the shaft coupled potentiometer. Control commands to the rotators are issued by simple contact closures for cw, ccw, up and down connected in parallel with the rotator's manual controls. This provides a convenient method for overriding the computer position commands.

A similar set of choices was necessary for the software. (The microcomputer was not open for choice, it was already in operation and not likely to be replaced!) The general specification for the program was that it require as input only equator crossing time and longitude for a desired pass and that it perform all other necessary calculations internally, commanding the rotators to point the antenna appropriately.

This left two loose ends, real time and orbital constants. It was decided to write separate programs for each satellite of interest, differing only in the fixed orbital constants.

Real time operation was a little stickier. It was finally decided to put a hardware clock in the computer because it would simplify applications in other amateur radio programs such as RTTY. Although the BASIC program is customized to a particular hardware clock (Comptek Model CL-2400) other schemes for deriving real time can of course be used.

At this point, it was necessary to decide on a hardware interface board to "read" the rotators and issue direction commands. The approach chosen called for a combination multiplexed A/D input and relay contact parallel output board. Since this exact combination does not exist among the many S-100 bus accessory boards, it was decided to design one to do the job efficiently rather than use up two chassis slots with separate boards or modify an "almost right" board.

Interface Board:

The interface board (6) was designed specifically for position readout from antenna rotators and for issuing direction commands to those rotators. Several features, however, give it wider application while serving as an antenna controller.

A 3½ digit BCD A/D converter with full scale reading of ± 1.999 volts is provided. Input to the converter comes from an 8 position multiplexer under program control. Up to 8 separate analog inputs may be read but two of these will normally be antenna position, leaving 6 for signal strength, transmitter output, etc.

There are 6 parallel output relays which may be individually latched on or off under program control. Normally, 4 of these will be used for rotator commands: up, down, cw and ccw. This leaves 2 free for transmit-receive switching, etc. The relay contacts are rated at 28 VDC, 250 Ma. maximum and external slave relays should be used if the rotator switch requirements exceed this.

In addition, there are 2 direct outputs and 1 direct input to the 8255 PPI available. The outputs will only drive 1MA, however, and must be buffered for TTL compatibility. The input is directly TTL compatible. Potentiometers allow full voltage from the rotator circuits to be set to 2.000 volts at the A/D converter input. This program assumes that 0 degrees elevation is represented by 0 volts and 90 degrees by 1.000 volts. Azimuth of -180 degrees is assumed to be 0 volts and +180 degrees to be 2.000 volts.

Appropriate modifications should be made to other rotator indicator circuits to obtain these voltages.

Software:

The BASIC used is TDL 12K Super BASIC version 3.0.

After initializing orbital constants, the program loads an assembly language routine which reads the C14433 A/D converter on the interface board. It is programmed in assembly instead of BASIC solely for speed. Most BASICS would not be fast enough to read all BCD output digits on the same conversion cycle thus leading to erratic results.

The program then gives an opportunity to slew the antenna to any desired position for testing or whatever purpose is in mind. Next, the hardware clock may be set by fast running if it is not already on time. The next option is for tracking the pass or else just printing the az-el pointing coordinates at intervals. The latter is useful for manual tracking before the rotator hardware is built or connected. The next option is for pre-AOS and post-LOS tracking when the satellite is beyond the maximum angle of observation. It leaves the elevation at 0 (attenuation through the earth would be rather high) but tracks the proper azimuth for attempting over the horizon DX.

If the tracking mode has been selected and the satellite has not yet come over the local horizon, the program waits until it does. Then at intervals of real time set, the current azimuth and elevation are computed and the antenna is positioned at those angles. Care has been taken to account for the possibilities of the track passing through the rotator stops at ± 180 degrees. If the track reaches one of these limits, the program stops and slews the antenna so that the desired azimuth is reached from the complementary side of the stop and tracking continues from that point.

After each antenna update, the current time, coordinates, range to the satellite and doppler shift are printed on the console. The doppler shift computation assumes the uplink and downlink frequencies of OSCAR 7,mode B and is not accurate for ranges beyond the maximum observation angle.

Note that alignment errors in the antenna mounting can be easily corrected in the program (assuming that you can figure out the error). One such correction appears in the elevation routine of the program.

Two features of the BASIC used which may not correspond to other extended BASICS are the formatting strings for the PRINT USING statement and the procedure, for calling the assembly language routine. Users should check these areas especially when translating to other dialects of BASIC.

Conclusions:

The results of this effort have been generally reqarding. The console display is a great aid in timing QSOs and looking for particular stations. In use with the NOAA satellites the system permits almost completely automatic picture acquisition.

Two negative features have turned up however, one of minor importance and the other a GREAT HAIRY MONSTER! The simpler problem is that for some orientations of the antenna array, the angular dynamics of the antenna-mast load interact with the control algorithm to produce a persistent oscillation of a few degrees beyond the dead band. This would be easily eliminated by a proportional control algorithm instead of "bang-bang" but the effect is so infrequent that it has been ignored.

The other situation is that awful spectre RFI! DX operation on OSCAR at low elevations is a weak signal affair and the last thing one wants is spurious signals. RFI generation by typical hobby microcomputers is intense within a hundred feet or so over the entire amateur spectrum. The author's system was no exception. A great deal of effort was put into shielding and "bead-choking" almost all lines exiting the computer case with only partial success. On the OSCAR-7 mode B downlink at 145.925 to 145.975 MHz numerous birdies are still present and they are modulated by the various operations of the program, often obscuring desired stations. Additional shielding and RFI tracing is obviously needed.

This problem could become serious inhibition to more widespread and successful application of microcomputers in amateur radio. It is hoped that this situation can be tackled by some of the numerous clever individuals in our hobby and some effective remedies found.

References:

1. B. Henson, WB0JHS, 73 Magazine, February, 1977, pg. 72.
2. A. Burke, W6UIX, 73 Magazine, November, 1977, pg. 58.
3. T. Prewitt, W9IJ, 73 Magazine, November, 1977, pg. 64.
4. D. Brown, W9GCI, 73 Magazine, July, 1977, pg. 46.
5. G. Bailey, WA3HLT, Ham Radio, January, 1975, pg. 26.
6. The interface board described is available in PC board or assembled and tested form from the author at: Dytron Inc., 241 Crescent Street, Waltham, MA. 02154, or through the Group Purchase Project.

Editor's Note—

The full text of the article was published in the proceedings of the Second West Coast Computer Faire in San Jose, California (P.O. Box 1579, Palo Alto, CA. 94302). It included software listings in TDL-BASIC and Assembly Language.

By the time that you are reading this, the PC card will be modified so as to contain an on-card time of day clock circuit based on a 3.5 MHz Color TV Xtal, and have provisions for battery backup power (to the clock only) to avoid the necessity of resetting the clock each time the computer is powered up.

TABLE 1

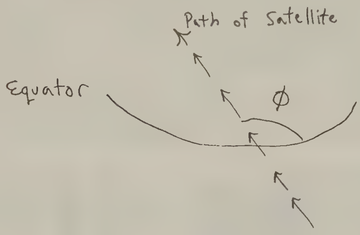
Step No.	Key Entry	Comments
01	ENTER ↑	Store Time
02	ENTER ↑	↓
03	RCL 5	compute fraction of period
04	÷	↓
05	STO 6	
06	R↓	Compute Δ longitude
07	4	and difference in
08	÷	long. of oscar and
09	RCL 0	qth
10	+	
11	RCL 3	
12	−	
13	STO 7	↓
14	RCL 6	Compute degrees of
15	3	movement along
16	6	orbit
17	0	
18	×	
19	1	
20	f → R	↓
21	x ⇄ y	Rotate to inclination
22	0	of orbital plane
23	g → P	↓
24	x ⇄ y	compute angle
25	RCL 2	
26	−	
27	x ⇄ y	
28	f → R	↓
29	STO 6	Rotate angle to long.
30	R↓	of qth
31	g → P	
32	x ⇄ y	
33	RCL 7	
34	+	
35	x ⇄ y	↓
36	f → R	
37	x ⇄ y	Rotate angle to lat.
38	RCL 6	of qth (azimuth)
39	g → P	
40	x ⇄ y	
41	RCL 4	
42	+	
43	x ⇄ y	
44	f → R	
45	R↓	↓
46	g → P	compute dist of satellite
47	RCL 1	↓
48	×	
49	x ⇄ y	Give azimuth first
50	(GTO 00)	End and Display

TABLE 2

Reg	Constant	Oscar 7 value
0	Long W. ascen. Node	—
1	Radius Sat. Orbit	4863.5 miles
2	Inclination of Orbit	101.77
3	Long. of your QTH	—
4	90 ± Lat. of your QTH	—
5	Period of Satellite	114.945
6	used in calculations	—
7		—

FIGURE 1.

Inclination of orbit is angle ϕ



BACK ISSUES AVAILABLE

Back issues of the Newsletter are available upon request in return for a donation to AMSAT.

If you specify what year you first joined AMSAT, we'll send you an assortment of ten earlier issues for $10.00, or fifteen issues for $15.00.

Certain pre-1974 and the September 1975 issues are not available.

Note that due to the time and effort involved in servicing back issue requests, the minimum donation should be $10.00.

Write to Back Issues, AMSAT, P. O. Box 27, Washington, D. C., 20044.

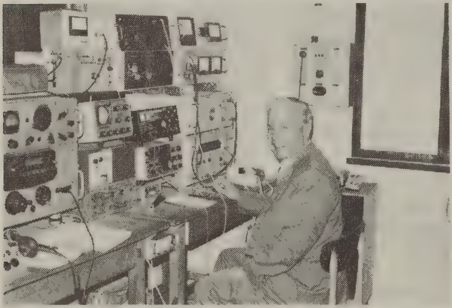
AMSAT-OSCAR 8 LAUNCHED

By Joe Kasser, G3ZCZ/W3

A-O-D became AMSAT-OSCAR 8 on Sunday, March 5, 1978. A "textbook" launch fired Landsat-C and its passengers into orbit from the Vandenberg Air Force Base in California, 551 milliseconds into the launch window. Radio amateurs around the world followed the launch sequence in real time by means of the AMSAT Launch Day Operations Nets activated by W3ZM, WA3NAN and others. The voice of Will Webster, WB2TNC operating from WA3NAN at the Goddard Space Flight Center in Maryland echoed around the world as he relayed the launch and subsequent phases of the orbit injection sequences. Such was the level of interest that several times no signals were present on 14280 KHz for periods ranging up to 90 seconds at critical points in the mission sequence. These periods of silence on 14280 KHz took place right in the middle of the ARRL DX Phone Contest. Hundreds of stations checked into the nets, many more called in or just monitored the activity.

The flight of the launch vehicle was followed, the ejection of Landsat noted, the additional orbit correction burns noted, and then OSCAR was ejected. Then, WA3NAN announced that OSCAR was free. 14280 KHz was silent; then G2BVN called in with the first report of telemetry reception from the AMSAT-OSCAR 8 spacecraft. Minutes later, W0PHD reported the first American reception of signals. Stations reporting reception of the telemetry on the first two orbits included: VE6SW, GM8BKE and N6DD.

WB5MPU reported one frame of telemetry when the satellite was well below his horizon. DL3SX telephoned Washington, D.C. with telemetry data. Early telemetry showed that the spacecraft was spinning at the gentle rate of 1.3 RPM. It was then decided to extend the 10 meter antenna on the first pass overhead the Eastern U.S.A. that night. Interest was high; everyone was available and the net opened up on 3850 KHz. Randy, VE3SAT, the Command Station, relayed the sequence of events as he sent the commands to the spacecraft and the "beep, beep, beep" of telemetry was heard by many listeners, relayed on 3850 KHz, as well as on 435.095 MHz as the antenna deployed.



Roy Stevens, G2BVN operating at HG5BME.

The initial telemetry data as reported by Roy Stevens, G2BVN, was: tone, 391 459 556 603 HI 173 251 389 459 556 606. During the first few orbits, the spacecraft stabilized. It should be noted that stations reporting from the U.S.A. indicated that Channel 6 was showing counts of the order of 601-603, yet stations in Europe were reporting 618-623, showing that signals were present in the uplink passband in Europe.

EYE-WITNESS ACCOUNT OF THE LAUNCH OF AMSAT-OSCAR 8

By James Eagleson, WB6JNN

We enjoyed watching OSCAR 8 go up Sunday morning, March 5 at Vandenburg. N6TX, Paul Shuch and I went down Saturday in caravan with Walt Reid, W6ASH and Nick Marshall, W6OLO. Got word at the Landsat briefing that the weatherman said "Go" (the weather outside to the contrary) but the city of Santa Maria thought their dam was too full and let some water out threatening the telemetry station. When the buses arrived the next morning to take us to the site, we all breathed a sigh of relief!

We weren't so happy upon arriving at the base to see only a dim outline of the vehicle some two miles distant. First it was hazy with about a 500 foot ceiling. We fully expected to see the thing lift off three rocket lengths into the air before it disappeared into the clouds.

We got through the 15 minute hold (at which time N6TX breathed a sigh of relief since that's where the countdown for OSCAR 7 stopped when the launch was scrubbed the last time he went down), and then we noticed that the clouds were opening a bit in the direction of the wind. Maybe we'll see something after all!

T-minus-five and counting, the "patch of blue" opened up into sky-to-sky blue and at lift-off we had perfect visibility even to the point of seeing second stage firing some 20 miles up! After losing the thing in the distance, we reboarded the buses, left the base, and ran into rain and overcast within one mile of leaving Vandenburg. (Paul, N6TX, suggested that since California's Governor Jerry Brown was there, it might have been something to do with his Catholic and Buddhist connections....on the other hand, my wife says maybe it was her praying for two fool hams driving a VW Bus down to southern California in the rain and wind?)

At any rate, it was a beautiful first launch for me, and Paul said it was pretty nice even considering some of the "commercial" launches he's seen. We rushed back to our hotel and got ready to go so that by the time of the first orbit, we were able to pick up the satellite from Paul's van on his vertical whip and ECHO 70. Unfortunately, ignition noise from the busy intersection where we were parked limited our ability to copy more than two data points, one was 601 and I don't recall the other, but considering the distance and no beam, we were quite pleased. (Good moonbounce reception practice, anyway...sigs were really buried in there.)

بالبريد الجوي
AIR MAIL
PAR AVION
空郵

SOUTHALL
10 30AM
10 JAN
1978
MIDDX.

LETTERS TO THE EDITOR

LANCE COVE
AM
11 I
78
NFLD

Dear Editor:

Permit me to throw a brick at G3IOR ("Powers that Be", December 1977) for his comments on the VHF/UHF phone-only licenses in Europe. He gives the impression that these operators are all novices with little technical knowledge and that they are responsible for many of the problems encountered by the so-superior CW operator, and so shouldn't really be allowed on the air at all! Not so. As G3IOR knows full well, but most of your readers will not know, in the U.K. (and, to the best of my knowledge, the position is similar in every European country which issues phone-only licenses) ALL applicants for a license are required to pass the same written examination, comparable in standard to the General class in the U.S., irrespective of the type of license they want, and our Class B license is in no way a novice license. Many Class B license holders are professional engineers, scientists and technicians who are interested in the technicalities of radio and electronics rather than CW operation and it was for such people that the British Class B license was created in 1964. G3IOR's jibe that they have "little idea of weak signal operation" is scarcely justifiable. There are, of course, black sheep in every fold, and undoubtedly there are VHF/UHF phone-only stations with a minimum of technical competence, but the same can be said of many CW operators; the ability to copy code is no guarantee of ability to do things in radio. It takes all sorts to make a world.

I found your article on AMSAT-OSCAR-D Spacecraft most informative and look forward to trying out Mode J.

Yours Sincerely,
Peter Whatmough, G8BFP

SAN FRANCISCO, CA 941
PM
6 JAN
1978

IN DE BUS
GEVON

Dear Joe:

I've been regularly listening to OSCAR passes (Mode A) and have heard more and more stations every pass. Still waiting to print up a suitable SWL card for confirmations. Hearing OSCAR has gotten me excited enough to start working on some uplink equipment. Hope to be on there soon.

I'd like to say that, since I don't have Mode B receive capability, I don't like the new schedule. I hardly get chances to listen, now with less Mode A passes, I've hardly gotten to listen to any. I guess it's all for the best, but it would seem to encourage more usage on Mode B, since OSCAR is in that more often.

Lastly, would like to add my complaint against the high power people. If they keep abusing the satellite, by the time I get set up, the satellite (s) will be defunct.

Many thanks for the FB newsletter and BCNU soon on OSCAR.

Bill Ralston, WA6KHB

(RS-OSCAR and A-O-8 should provide sufficient Mode A ----Joe).

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UPDATE ON THE PERPETUAL ORBITAL COMPUTER PRINTOUTS FOR OSCAR

By Bill Johnston, N5KR (ex-WB5CBC)

Since the appearance of the original article in the September 1975 AMSAT Newsletter[1], several thousand printouts have been mailed out to OSCAR users around the world. These have been about equally divided between U.S. and foreign hams, and new requests still arrive daily. Due to the increasing number of questions I receive concerning availability of the printouts, and the increasing numbers of OSCAR users, it seemed appropriate to bring everyone up-to-date.

In answer to the most common question -- yes, the printouts are still available, though the cost has increased by about 25 cents, due to two postage rate increases. If you already have one of the perpetual printouts, you don't need another one unless yours is worn out. The printout is good for the life of AMSAT-OSCAR 7, and for any other satellite with the same orbital inclination and period (e.g., several existing weather satellites, and AMSAT-OSCAR 6 while it was still active). The printout can continue to be used for any future satellites put into this same orbit..

To review, the printout consists of 80 to 100 pages (the exact length depends upon your station's latitude and longitude) with a series of tables based on the longitude of the equator crossing (ascending node). There is a separate table for every possible equator crossing point, in one-degree increments.

You start out by obtaining the time and longitude of equator crossing for the pass you're interested in (this is found in monthly tables published in the various ham magazines, or in more elaborate form from the W6PAJ booklet). Then you go to the table in the printout that corresponds to that equator crossing longitude. (If no table is present for that longitude, that means that the satellite will not be in view of your station on that pass).

The table consists of a series of entries giving the time, azimuth, elevation, and range computed at one-minute intervals throughout the pass. The time that is listed is the number of minutes after equator crossing, and you simply add this to the time of equator crossing to get the exact time of day associated with those particular azimuth and elevation figures.

For example, let's suppose you go to the W6PAJ calendar, or to one of the ham magazines, and find that the equator crossing is at 88 degrees longitude at 16:23 GMT. You then go to the perpetual printout and look up the table for equator crossing at 88°. Suppose the first entry in that table has a time of 6 minutes, an azimuth of 144 degrees, and an elevation of 1 degree. You just add the 6 minutes to the equator crossing time of 16:23 to get the exact time of 16:29 GMT. So at exactly 16:29 GMT, the satellite will be at an azimuth of 144 degrees and an elevation of 1 degree, as viewed from your station. Should a time appear in the table as a negative number, that means you subtract it from the equator crossing time instead of adding it.

Anyone who would like a printout for his own station will need to send the following:

1. Name and mailing address.
2. Town that you want the printout computed for. If less than 10,000 population, please include latitude and longitude, or carefully describe location.
3. Payment to cover the cost of generating and mailing the printout, as follows:

   $3.30 by 4th class mail, worldwide.
   $4.00 by First Class mail, U.S.A., Canada, Mexico.
   $5.00 by Air Mail, worldwide.
   IRC's (new series only) may be substituted at the rate of 18 cents per IRC.

Send the above to:'

Bill Johnston, N5KR, 1808 Pomona Drive, Las Cruces, New Mexico 88001, U.S.A.

A lot of people have written to me about printouts for future satellites, and I would like to elaborate on that subject just briefly. As mentioned previously, any satellites put into the same orbit as AMSAT-OSCAR 6 and 7 would use the existing OSCAR 6/7 perpetual printout. A satellite placed in any other circular orbit would require its own perpetual printout. There are indications that all four of the Soviet RS series satellites will have the same orbital characteristics (though considerably different from AMSAT-OSCAR 7), so a single perpetual printout would serve all of them. Since OSCAR 8 is in a different orbit than OSCAR 7, it requires its own perpetual printout. These printouts will be available about the first of April, and the cost will be the same as described above.

Unfortunately, other satellites in non-circular (i.e., highly elliptical) orbits do not lend themselves to this type of perpetual printout. The reason for this is that the apogee and perigee precess around the earth, and a pass with a given equator crossing longitude will not have the same azimuth and elevation angles as a pass with the same equator crossing longitude, say four months later.

In any case, perpetual printouts for OSCAR 7 and 8 will continue to be available and the availability of printouts for future satellites will be reported in the AMSAT Newsletter. If you have any specific questions, please be sure to enclose a self-addressed stamped envelope.

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[1] William D. Johnston, WB5CBC (N5KR), "Perpetual Orbital Printout for OSCAR 6 and 7", AMSAT Newsletter, September 1975.

PHASE III FUNDING STATUS REPORT

By John Shew, N4QQ

Hardware costs for the Phase III project are expected to be in the neighborhood of $250,000 for two satellites. A complete Phase III satellite requires:

2400	Solar Cells	at $10/each	= $24,000
12	Battery Cells	at $200/each	= 2,400
1	Kick Motor		10,000
2	Transponders	at $5,000/each	= 10,000
2	Cosmac Computers	at $8,000/each	= 16,000
		TOTAL	$62,400

A viable Phase III program requires at least 2 complete satellites ready at any launch date, the unused backup hardware available for a later launch.

We have passed the first milestone in our fund-raising campaign. As of February 8, 1978, donations have been received for 2,637 solar cells and 36 battery cells. Thus, we have received donations for more than enough solar cells for the first Phase III satellite and three complete battery systems. According to the last regional tally, submitted by Larry Papke, WB5MPU, who handles printing and distribution of solar cell certificates, contributions have been received from all 50 states, all Canadian provinces and over 42 foreign countries. A significant number of the contributors are non-amateurs, testifying to the universal appeal of the amateur satellite program.

All contributors to the Phase III program receive a handsome certificate, acknowledging the exact numbered component sponsored. Contributors of $1,000 or more will be honored by having their name inscribed on a plaque to be placed onboard the first Phase III satellite. A partial list of those names to be inscribed on this plaque includes:

AIL Division of Cutler-Hammer
Sea-Q-DX Association
Dayton Amateur Radio Association
Personal Computing, Inc.
West Allis Radio Amateur Club, Inc.
Jack Dietrick, WA9AHZ
Joseph F. Walsh, WB6ACU
Wheaton Community Radio Amateurs
Larry Wayne Campbell, WA4WDN

Our thanks also must be offered to QST, Ham Radio, 73, CQ and World Radio News for their generous donation of space publicizing AMSAT Phase III and our contribution program. Not only has their exposure been instrumental in our solar cell campaign, but also in soliciting new AMSAT memberships.

We have made a significant start. However, more contributions, both large and small, are needed.

OSCAR ACTIVITY IN SOUTH AFRICA

By Gregory Roberts, ZS1BI*

OSCAR activity in South Africa, like in many other parts of the World, has shown a dramatic growth since the launch of OSCAR 7. Prior to this, few stations had operated OSCAR 6 and very few two way contacts had been made. In fact, with my first QSO via satellite-OSCAR 7 January 1975, I established the first ZS1 (Cape) to ZS6 (Transvaal)contact on cw with ZS6D. This is about 1000 kilometres and is now regarded as the minimum one can expect to get. An idea of the growth can be had from the number of operators heard and worked in each year.

Year Ending	Mode A	Mode B
1974	3	0
1975	13	2
1976	31	12
1977	63	27

Fortunately, from the QRM point of view, a good percentage of these are heard infrequently and currently there are about a dozen operators, most of them operating mode A and B. With the forthcoming launches of AOD and the RS satellites, a big increase is expected.

South Africa is not particularly well situated for DX contacts and most of the contacts are confined to the six ZS divisions. From time to time, DX does appear and these stations are much in demand by those stations capable of working DX. A large number of stations try with the minimum of equipment, make a few contacts and are then disappointed that they do not get the more distant stations. Those that have bothered to improve their ten metre reception find that there is more activity.

Starting towards the east, the first major land mass is Australia. Calculations show that a ZS-VK contact is possible and several east coast ZS stations have made a special effort to work VK but no luck so far. It would appear that any VK operators do not bother to work the low western passes. Continuing clockwise, the next bit of land is Antarctica and to date, only one station has appeared in this direction, namely 8J1RL at the Showa Base. This station was operational on mode A for about a year on cw and ssb, but because of the Southern Hemisphere effect, this station had problems working ZS and the only confirmed contact was between 8J1RL and ZS1BI.

The next continent is South American and once the first contact was made by PY2BJO and ZS1BI on mode A and B, it then became an easy contact and several ZS stations have worked PY and LU on both modes. ZS stations that have achieved confirmed two way contacts are ZR1AT (ZR is the prefix for a class of licence that allows operation on 2M or higher, hence on mode B), ZS2BD in East London and ZS1BI in Cape Town. Several islands have produced OSCAR stations, namely ZD9GG on Gough Island, and VP8PM on the Falkland Island copies ZS stations, but no two way QSO yet as VP8 is a little slow in getting fully operational. ZD8 was heard several times, but no ZS two way contact was made as ZD8 abandoned OSCAR after only a few passes.

Northwards is the vast continent of Africa, but because of the technological level of this area, OSCAR contacts are rather rare and the vast majority have been the results of foreigners to the continent; i.e., missionaries and doctors, or others temporarily located in Africa because of salt mine work. OSCAR stations have appeared in Senegal (6W8ZK), Ivory Coast- many in this case as a result of the fine work done by OM Hugh, TU2EF who has now moved to PY land. Ghana was active for a short while, as was Cameroons, Kenya, Sudan, Zambia, Rhodesia, Uganda, and Togo. Contacts northwards out of Africa are somewhat difficult on account of the Southern Hemisphere effect and because few northern stations operate mode B. However, the record ZS DX contact was made on mode B between 9H1CD and ZS1BI, about 7885 km. ZS6BNT has been the only ZS station to work Italy- mode B, and ZS6HS has worked Israel on mode A. EL0AA/MM at the top of the Red Sea has been worked on mode B by ZS2BD, ZS6HS and ZS2BI. India has been heard by ZS6JW but no two way QSO to date as the Indian station spent all the available time in calling CQ (in CW) and not listening for replies. With a bit of mutual planning, it should be easy for ZS5 and ZS6 land to get India. Several DX stations report having heard various ZS stations, e.g. Gibraltar, Sultanate of Oman and Israel report copying ZS1BI on mode A, but a two way contact is virtually impossible.

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P.O. Box 9, Observatory, 7935
South Africa

Despite this lack of real DX,several ZS stations are working for various OSCAR awards and to date, three African stations have achieved the OSCAR 1000 award, namely ZE7JX, ZS1BI and TU2EF. The following additional stations are not too far away from achieving this award, namely ZS6HS, ZS6JW, ZS5JF, ZS6BGQ and ZS2BD.

All active OSCAR operators in ZS receive computer printout data for their individual locations. This information includes rise and set times, as well as bearings and at culmination gives the time, azimuth, elevation and range. This program was written by ZS1BI in Fortran and is run on a Data General Nova 1220 computer. Input data is NASA two line orbital elements and any satellite orbit can be handled, including the Phase III type, as eccentricity and drag, for example, are strictly taken into account.

Most of the communication takes place on ssb with some cw. RTTY and SSTV are very infrequent and ZS6BNT and ZS3HM are the only ones achieving a two-way SSTV contact. FM is never used and the "no operation" on Wednesdays is well observed. High power operation is infrequent and the majority of stations run rigs like the Yaesu FT220, FT221, Multi 2000, Multi 2700, etc. On mode B, the most common transverter is the Microwave modules unit. One or two stations do operate in excess of about 500 w ERP, but their operation is infrequent and I have become somewhat unpopular with the high power users as I have dared to tell them that they are running too much power. Generally, the cooperation is good and I do not think that other world-wide OSCAR users need worry about poor operation here in South Africa.

Publicity for OSCAR, and AMSAT, is provided in several ways. OSCAR is a very frequent subject of conversation on the two metre FM and SSB nets and generally excellent coverage is given to amateur space communication. An H.F. net is held every Saturday at 1100 GMT on 14.280 Mhz on USB and ZS1BI is net control station. Attendance fluctuates between four and a dozen, but there are many listeners as can be judged from the correspondence received. Additional publicity is provided by the South African Radio League publication "Radio ZS" where news items appear from time to time. A quarterly newsletter, averaging about 10 A4 sized pages, called "OSCAR ZS" is prepared by ZS1BI and is sent to most active OSCAR ZS users, as well as several in South America. Copies are also sent to AMSAT, AMSAT UK, ARRL, VERON and to the SARL.

All in all, amateur satellite communication is in a healthy state here in South Africa and we look forward to the Phase III satellites. We only hope that we will be able to penetrate the QRM and high power levels used by European stations. Judging from the stories I've heard, we can expect many problems in this direction-- why is it that European stations find it necessary to run excessive power? We here in South Africa have never found it necessary.

AMSAT-OSCAR 8 ORBITAL DATA CALENDAR

In cooperation with AMSAT, Skip Reymann, W6PAJ is publishing an AMSAT-OSCAR ORBITAL PREDICTIONS calendar containing all orbits of the new AMSAT-OSCAR 8 satellite for the remainder of 1978. It should be available by the end of May.

The orbital calendar is available postpaid for $5.00 U.S. funds or 30 IRC's ($3.00 to AMSAT members, and free on request to AMSAT Life Members). Overseas orders will be airmailed. Orders and payments should be in U.S. Currency to: Skip Reymann, W6PAJ, P.O. Box 374, San Dimas, California 91773 U.S.A. Orders may also be charged to VISA or Master Charge. (Be sure to provide your account number, expiration date and other information on your charge card).

Important - To speed up handling of your order, please include a gummed, self-addressed label.

Proceeds from the orbital calendar benefit AMSAT.

For those still without an AMSAT-OSCAR 7 orbital calendar, a new printing is expected to be available shortly from Skip Reymann. Prices and ordering information are the same as for the OSCAR 8 calendar.

THE AMSAT-OSCAR QSL BUREAU (HOW IT WORKS)

By Ross W. Forbes, WB6GFJ

The AMSAT-OSCAR QSL Bureau is established as a service to help distribute QSL cards for contacts via the OSCAR satellites. This bureau will handle any number of QSL cards that you wish to send, to any station, for any contact via OSCAR. The Bureau's address is P.O. Box 1, Los Altos, California 94022.

To use the AMSAT-OSCAR QSL Bureau, just send your cards for distribution, and have an SASE on file: non U.S. stations should have an SAE with IRC's on file. Cards going from North American stations to other stations in North America can be sent to the AMSAT-OSCAR QSL Bureau for no charge. Cards from North American stations to stations outside of North America (KH6 not included) will be forwarded at the rate of 6¢ per card, or may be sent in bulk at the rate of 20 cards for $1.00 in U.S. money; money for forwarding cards only, do not send stamps to cover forwarding fees. Cards from stations outside of North America wishing to send cards to stations within North American can do so for no fee. It all comes down to if a station has an SASE or SAE and IRC's on file, it costs nothing to send the card to the station via the AMSAT-OSCAR QSL Bureau. Stations outside of North America are welcome to use the bureau and to keep an SAE and IRC's on file for incoming cards. Should you wonder what the money is for, it covers the postage to forward the cards, as well as envelopes used for forwarding: AMSAT nor I make a single cent out of the money received at the Bureau.

The previous information concerning the use of the QSL Bureau is similar to information you can receive from the bureau on request, or that you might have received with your QSL card shipment from the bureau. Let us look into what happens in the bureau to your money and your QSL cards.

Your envelopes and QSL cards that are sent to the AMSAT-OSCAR QSL Bureau arrive at Post Office Box 1, in Los Altos, California, about 35 miles south of San Francisco. All received mail is picked up, then opened and sorted according to QSL cards, envelopes, and correspondence. If you ever write to the bureau with a question, I assure you that you will receive an answer. Your comments and suggestions on the AMSAT-OSCAR QSL Bureau are encouraged and welcomed!

After the initial sort, all SASE's (or SAE's and IRC's) are stamped with the date they arrived, stamped with the AMSAT QSL Bureau return address, checked for postage and call sign, and stamped with a note to inform the user how many envelopes are still on file. The envelopes are then sorted by call area, alphabetized and placed in the file with all other SASE's and SAE's. At this time, SAE's from non-U.S. stations have their IRC's converted to postage and the postage attached to the SAE.

The QSL cards received are then processed. Those with money and that are to be forwarded to stations outside North America are processed. The money received from each station is noted and an individual "account" or record for each station sending money is then set up indicating the date of receipt, the amount received and what kind of money was received-- check or cash. On each account will also be a list of the stations that cards were being sent to, for any future reference. The DX cards are then processed. After the money is totaled, all QSL cards are stamped with the date they are received at the bureau. This date will not effect your card for any award and is quite standard practice at a number of QSL Bureaus throughout the world. QSL cards are then sorted by call area and finally alphabetized. The cards and envelopes remain alphabetized and separated until the day comes for mailing.

In reply to a survey, most stations requested a mailing once a month. I will guarantee that there will be a mailing every month from the AMSAT-OSCAR QSL Bureau to those stations with cards on file for their corresponding SASE's. If you wish for me to hold your envelope longer, please tell me when you send your SASE (or SAE and IRC's). One station requests that I mail the envelope every other month, to which I add the requested month to the SASE. To those wishing to have the SASE mailed when full, I prefer that you change your request to ask that your envelope be mailed when it contains a certain number of cards: 5 or 6 cards seem to make up for one ounce of postage. Please remember that the longer you ask that your envelope be held, though, the slower your service will be!

On the day that cards are placed in their corresponding envelope for mailing, every card gets checked for an envelope. As each envelope is handled, I write your call sign down indicating you had an envelope on file, the date the check was conducted, plus if you had any cards on file. If you do have cards on file, I note what modes they were for. This information is passed on to AMSAT headquarters, and is additional information used for the "User's Directory". As cards are placed in the envelope, I see how many envelopes are still on file, and indicate the information on the note previously stamped on the front of the SASE; therefore, please check your envelope when you receive it from the bureau. Right after the envelopes are filled, I type up a brief bulletin to all AMSAT Net Control stations and send it out with all of the SASE's; thus by listening to the AMSAT Net's you'll find out when the bureau mailing occurs.

So much for what goes on at the AMSAT-OSCAR QSL Bureau. Now for a few side notes. About once each quarter, I will notify all of the AMSAT Nets, the calls of stations with QSL cards on file, but without an SASE. As there could be up to two weeks by the time the information is collected and then received at the Net Control station, you might have already just sent an SASE to the bureau. In any event, if you have any questions about the bureau, or what you think you should have on file, please drop a note to the bureau, and I'll be happy to bring you up-to-date. Another use for the date stamp on the QSL cards is to tell me how long cards have been in the bureau. After the card has been on file for a year and no attempt has been made to claim the card despite notification by the bureau, the "old" cards will be destroyed.

An important point to remember, is that you should put only one call sign on each SASE. The only exception to this will be the case of a QSL Manager for a DXpedition; for example W1BIH can include PJ9JT since he is the manager. However, WB6GFJ and WB6QDC cannot be on the same SASE. If you update your call sign, or change calls, please send a new SASE for the new call sign. If you move QTH's, feel free to send a new address label for your current SASE's so that the new address can be added. When you send money for forwarding DX cards, please send U.S. currency; non-U.S. stations, only, are permitted to send IRC's to cover forwarding postage.

Another suggestion: do not run your SASE through a postage meter. There is a fine print rule in the U.S. Postal regulations that prevents an envelope run through a postage meter in one area, to be mailed from another area; as strange as this seems, it is fact as confirmed by personal experience and by a ham associated with the postal department.

I have tried to touch upon the basic operation of your AMSAT-OSCAR QSL Bureau. The bureau is here for all the users of the OSCAR satellites and will handle any amount of QSL cards that you wish to send. By the way, we will return any card sent that is for a contact on any band other than via OSCAR. So far the traffic averages about 1,000 to 1,200 cards per month, but will handle more. Let us all get in the habit of telling the stations we work via the satellites to QSL VIA THE AMSAT QSL BUREAU!

HP 67/HP 97 ORBIT PROGRAM

By Roy Welch, W0SL
AMSAT Coordinator, Missouri

The program will run in either of two selectable modes; Real Time and Batch modes. When run in Batch mode, the program will display Azimuth and Elevation of ground station coordinates to an orbiting satellite such as OSCAR 7 and A-O-D. The display will remain stable until the R/S Key is depressed. The program will then select a time two minutes later and display new coordinates. The Batch mode is for use when one wishes to make listings of AZ/EL information for various equatorial crossings.

The Real Time mode allows one to enter the longitude of the Northbound (Ascending) Node (NBN), NBN clock time and current clock times. The program will then begin to display current AZ/EL coordinates and update them for new coordinates at one minute intervals. Calculation takes about 21 seconds. The remaining 39 seconds of each minute is consumed by the display output (looping). This mode is useful in that it eliminates the pre-orbit AZ/EL pencil labor. Either mode may use the clock time input or the simple "minutes after NBN" approach to set the time factor.

I will be glad to furnish a copy of the documentation to anyone sending me a SASE (large size please) to 908 Dutch Mill Dr., Manchester, MO. 63011. I will also answer any questions concerning the program.

I've got another program already written and tested for the Phase III elliptical orbits, but don't have it documented yet.

P.S. I will also record the program on a blank program card if one is sent with the SASE.

THE AMSAT-80 COMPUTER PROJECT

PART III

By Joe Kasser, G3ZCZ

UPDATE

There was no mailing in January. This was due to lack of time. The basic hardware and software have now been completed and two prototypes built. One uses a full hardware front panel and was shown in the last Newsletter. The second has no front panel controls at all except for an I/O port, Boot and Reset Switches.

ANSWERS TO COMMONLY ASKED QUESTIONS

(1) The hardware uses the S-100 Bus. If you have an S-100 Bus System, hardware should work without any changes. If you do not have an S-100 Bus or an 8080 based microcomputer and you want to use project hardware, you will have to take care of any hardware modifications.

(2) The only software that we have available is that which is announced in this publication.

(3) We cannot design your system for you. Designing by mail for people with technical abilities that we know nothing about does not work. A computer is expensive. We'd rather not get into a position where we recommend an expensive investment that will not work because of a misunderstanding. Join a local microcomputer club and get the help you need there. Then, for economical reasons, get your hardware and software at discount prices via the GPP.

AMS-80

The AMS-80 debugging routine and I/O handlers is now available for release. It is currently at version 5.7. It is a comprehensive program and comes in two sections - standard and custom. The standard section is the same in everyone's system. The custom section contains the command table and I/O routines for the system. If you wish to obtain AMS-80, see the GPP update section for details, but you must supply us with your I/O device driver routine(s) if you wish us to program them for you. We can program 1702A and 2708's or supply a paper tape in object format, as well as the paper listings.

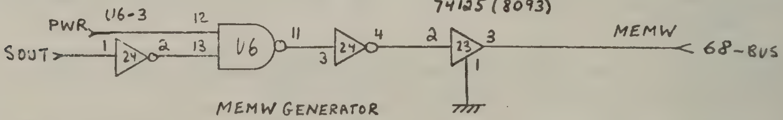
SYSTEM DESIGN

The AMSAT-80 project is designed as a hardware-software system. If you already have a computer, AMSAT-80 software can be overlaid on it easily. If you have another Z80 or 8080 system, the software will still run, if you use AMS-80 as your I/O controller and driver. If you do not have a system, you can put one together using GPP parts. You will need two circuits that are not standard as follows:

(1) MEMW generate

(2) JUMP ON RESET to FOOO (hex).

Circuitry to implement these funtions are shown below and can be built up on a wire-wrap or a IO-2 card. Some S-100 cards available have these features and may be used. You can assemble as large or small a system as time and finance permit, but once you are up, you can do things with it.



MEMW GENERATOR

GROUP PURCHASE PLAN FOR AMSAT AND CMC

CURRENT LIST AS OF 20 FEB. 1978

*****Solid State Music/CYBERCOM

MB-3 ------------- 4k byte EPROM card for 1702A EPROM's. Can also be used as a 2k byte card, and has 0-3 switch selectable wait states. Includes Board, components, sockets, support chips, but no 1702a's (see below). Suggested for holding the AMS80 MONITOR Software!

MB-4 ----------- 4k bytes of 2102A RAM.

MB-6 ----------- 8k bytes of 450ns 2102A RAM.

MB-6 ----------- 8k bytes of 250ns 2102A RAM.

MB-7 ----------- 16k bytes of fast NEC uPD410 static RAM. 200ns.

MB-8 ----------- 8 or 16 byte EPROM card for 2708's. Newest version has automatic enabling so that RAM and ROM can be easily mixed. Does not include 2708's.

MB-9 ------------- 4k byte ROM/RAM card. Reusable link PROM and RAM can be mixed for those special applications.

VB-1B ------------ 1k byte video RAM board. In text mode, card maps the 1k byte area into a 16 line x 64 character TV picture. Also supports graphics with a 128 wide x 48 high dot matrix on the screen. Text and graphics can be mixed with some limitations. This board has been recently improved to minimize "snow" and to minimize overscan problems with modified TV sets. This board is supported by the AMS80 software in both the text and graphics modes. Text output using AMS80 software driver can be user selected in either a scrolling or page mode.

MT-1 ----------- 15 slot S-100 bus mother board. Originally designed as an Altair 8800A extender, but homebrewers have used it as-is to build their machines.

XB-1 ----------- S-100 bus extender card, with connector.

SB-1 ----------- Music Synthesizer board, Mal Wright's famous MUS-X1 music language interpreter software.

10-2 ----------- 8-bit input and 8-bit output ports and supporting port decoders. Has lots of kludge area for wire-wrap or solder-tail sockets for ??? Can be used for power-on jump start, MEMW signal generation, UART/USART, or whatever your imagination can dream up.

10-4 ------------ two separate USARTS for two independent 20ma/RS232/TTL serial I/0 ports. Supports all the standard speeds. Also has two 8-bit input and two 8-bit output ports. If Proc. Tech calls their board 3P+S, then this one is 2.5P+2S.

SSM-V1 -------- when ordered with MB-3 or MB-8. An EPROM monitor, somewhat similar to AMS80, but less flexible. Comes on 2k bytes of 1702A or 270B.

Coming soon -- a video board that implements the ADM-3 type "dumb terminal" on the S-100 bus, and a new "odds-and-ends" board with jump-on-reset and lots of kludge area.

Also available -- contact us -- bare boards for many of the above.

*****North Star. Note that we have to pool orders to get good prices, so it may take a bit longer, but patience saves money!

MDS-A ---------- a complete floppy disk system using Shugart SA-400 microfloppy drives. The hobbyists standard.

Drives ---------- extra drives for MDS-A.

Diskets for MDS-A.

Contact us if you would be interested in North Star's HORIZON kit, CPU + case + serial port + power supply + one drive of MDS-A.

*****Parasitic Engineering and Thinkertoys available at small discounts, including the Equinox and Equibox systems.

*****AMSAT specials

32K RAM BOARD -- wired and tested, using TI TMS4044 STATIC chips, with each 4k byte block independently addressable. A beautiful board you can see pictured in Kilobaud, Dec. '77 page 3. Populated as follows:

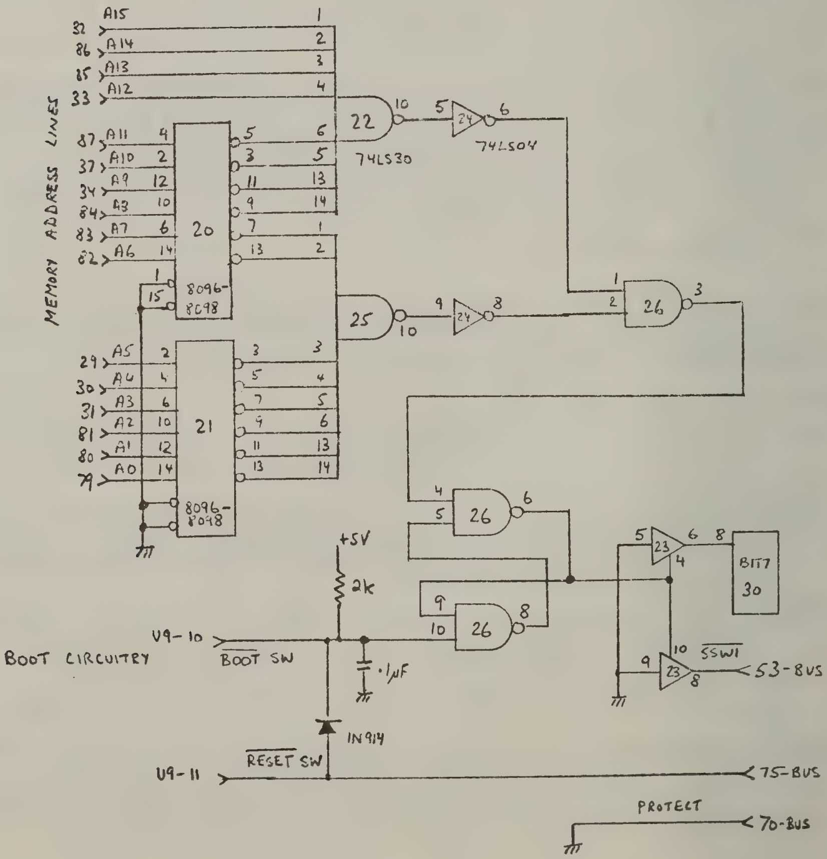
8k
16k
24k
32k

ANTENNA CONTROLLER BOARD. Contains a 3.5 digit voltmeter with 8-input MUX, and 6 relays for controlling Az and El or whatever, See the article by W1HDX in March '78 AMSAT NEWSLETTER for more info. Two versions will be available, with and without a clock. The clock uses a commercial clock chip so that you can keep track of time-of-day as well!

Also available are: Basic boards, with or without clocks, in kit or wired form. S-100 edge connectors with spacing for IMSAI, MT-1, Thinkertoys, etc. Boards (but NOT Altair). Specify if you must have wire-wrap, otherwise we will ship either wire-wrap or solder tail at our discretion.
1702A's --- Intel, AMD etc., prime and virgin.
2708's ---- Signetics, Intel, etc. prime.
2102A's --- Prime, 450ns.
2102A's --- Prime, 250ns.
TI tin-plated solder tail sockets in 8, 14, 16, 22, 24, 28 and 40 pins.

For ordering information, send an SASE to:

Computer Project-GPP,
c/o T. Clark, W3IWI
6388 Guilford Rd.,
Clarksville, Md 21029



AMSAT OPERATING AWARDS

Each year for the past three years, AMSAT has introduced a new satellite operating award. Awards currently available are the AMSAT Oscar Award (AOA), the Oscar Sexagesimal Award (OSA), and the newly created Oscar Century Award (OCA). The objective, in all cases, is to establish and confirm two-way QSOs with different stations via any amateur radio satellite. The basic counting QSO-elements are as follows: US states, Canadian call-areas, and other countries. The AOA, OSA, and OCA certificates are available for 20, 60, and 100 QSO-elements, respectively. In addition, endorsements are available for the AOA in 10 QSO-element intervals ranging from 30 to 90. (To date only three OCAs have been issued, recipients being G3IOR, WA2CBB, and W2RS.) Alternately, the AOA can be obtained by establishing and confirming two-way amateur radio satellite QSOs with 6 Australian call-areas and two other countries; or with 8 different Japanese call-areas and four other countries; or any other requirements as specified by the AMSAT Board of Directors. Generally QSL cards or other written confirmation of contacts must be submitted to verify the QSO-elements claimed. However, in lieu of such QSL cards, applicants may submit a list of contacts confirmed by the awards manager of their national amateur radio society or AMSAT affiliate organization. Appropriate QSO credit may be claimed for AMSAT issued awards and endorsements. All contacts must be made from the same QTH, i.e., within an area of 40 km (25 miles) from any given location. The awards are free to all AMSAT members, so be sure to specify your membership number upon application. However, sufficient postage must be supplied for the return of QSL cards. A service charge of one US-dollar ($1) is required for the AOA, $2 for the OSA, and $5 for the OCA, for all non-AMSAT members.

All awards are available from AMSAT Awards Manager, PO Box 27, Washington, DC, 20044, USA; alternately the AOA and 10 element endorsements may be obtained from any of the following area award managers: DC9DX, F6BEG, G8KLO, OZ1WL, SP9DH, VK5HI, and ZL2GX.

AMSAT AWARD STATUS 31 DEC 1977

The following stations have qualified for

AMSAT operating awards. Have you ?

OSCAR SEXAGESIMAL AWARD

NR	CALL	AOA	AWARDED
01	WA7GCS	8	31JUL75
02	WA3LND	35	06NOV75
03	WA2CBB	4	25NOV75
04	VE5XU	50	07JAN76
05	OH2RK	54	16JAN76
06	VE3BNO	2	16JAN76
07	K2OVS	78	13APR76
08	W4WSF	11	30APR76
09	W6CG	16	15MAY76
10	W4GCB	5	15MAY76
11	W3BWU	-	15MAY76
12	K7VNU	6	15JUN76
13	W1JAA	71	03JUL76
14	W6ETJ	41	09JUL76
15	K9EIV	68	09JUL76
16	W6NZX	49	09JUL76
17	WA4LBO	10	09AUG76
18	OK3CDI	65	30AUG76
19	DK4QE	20	30AUG76
20	WOSL	7	15SEP76
21	W1JSM	105	17SEP76
22	WB4HQE	88	17SEP76
23	DJ2RE	25	17SEP76
24	WA3DMF	40	11OCT76
25	W4AIT	108	22OCT76
26	W6HEW	82	22OCT76
27	WB9RJQ	89	12NOV76
28	YV5ZZ	58	12NOV76
29	WA3THD	01	30NOV76
30	W1CRL	74	30NOV76
31	DJ1QT	36	17JAN77
32	W9OII	93	17JAN77
33	G3IOR	G-08	14FEB77
34	W2HXF	98	17FEB77
35	WOII	118	17FEB77
36	VE3TP	57	04APR77
37	K4CAW	61	08APR77
38	W2RS	43	21APR77
39	WBONST	48	23MAY77
40	WB5MPU	86	30JUN77
41	W4RJC	130	15JUL77
42	W2UZL	115	30AUG77
43	K2ZRO	134	04NOV77
44	K9SM	138	25NOV77
45	YO2IS	51	13DEC77
46	PAOLQ	139	13DEC77
47	W4FJ	141	31DEC77

OSCAR AWARD

OSC. NR.	CALL SIGN	QSOS	LATEST UP-DATE
01	N3ES	66	26JAN77
02	VE3BNO	90	12NOV76
03	WA1EHF	33	24JUL75
04	WA2CBB	100	08APR77
05	W4GCB	61	15MAY76
06	K7VNU	60	15JUN76
07	W0SL	80	30AUG77
08	WA7GCS	62	31JUL75
09	K3JTE	20	31JUL75
10	WA4LBO	60	09AUG76
11	W4WSF	62	30APR76
12	W5UCY	52	30AUG77
13	OA8V	30	02NOV75
14	W3GF	20	10OCT75
15	WA1SCV	50	07JAN75
16	W6CG	63	15MAY76
17	WB0IUT	30	19SEP75
18	WA6JFP	22	10OCT75
19	W7MKW	40	17FEB77
20	DK4QE	50	10OCT75
21	WB5DCY	40	10OCT75
22	W9JUV	22	10OCT75
23	WB2TNC	23	17OCT75
24	WB2TNC/3	37	17OCT75
25	DJ2RE	60	17SEP76
26	W3TFA	50	30AUG77
27	K3AKR	24	20OCT75
28	K5DZE/5	24	02NOV75
29	K3MWV	20	02NOV75
30	W2FBF	30	06NOV75
31	K2OVS	20	06NOV75
32	W5UOJ	25	06NOV75
33	WA5TJB	30	06NOV75
34	K6BAZ	20	06NOV75
35	WA3LND	75	06NOV75
36	DJ1QT	70	17JAN77
37	W7ZC	50	14NOV75
38	W6DQY	20	21NOV75
39	WA9PVV	20	21NOV75
40	WA3DMF	80	30AUG77
41	W6ETJ	60	09JUL76
42	K5BWZ/8	30	24NOV75
43	W2RS	112	21APR77
44	WA0IYY	20	07DEC75
45	W6RQZ	20	07DEC75
46	K9LCR	20	07DEC75
47	KL7JDO	20	05JAN76
48	WB0NST	60	23MAY77
49	W6NZX	60	09JUL76
50	VE5XU	80	10MAY76
51	YO2IS	60	13DEC77
52	VE7BYA	20	23JAN76
53	WB2RTF	20	07JAN76
54	OH2RK	60	16JAN76
55	W7LFX	50	16JAN76
56	W2EUO	21	16JAN76
57	VE3TP	60	04APR77
58	YV5ZZ	61	12NOV76
59	W7JDZ	20	23JAN76
60	W7VEW	38	23JAN76
61	WA1POJ	30	12FEB76
62	DU6EG	15**	23JAN76
63	SP2DX	36	30JAN76
64	WA4DDH	20	28APR76
65	OK3CDI	60	30AUG76
66	WA6UAP	20	06FEB76
67	VE3EYR	22	06FEB76
68	K9EIV	70	17FEB77
69	W9HVP	30	12FEB76
70	WA1SQB	20	12FEB76
71	W1JAA	83	07MAR77
72	K3RXK	20	12FEB76
73	W3LB	20	05MAR76
74	W1CRL	80	25NOV77
75	K4CAW	61	08APR77
76	TU2EF	52	04NOV77
77	W7CTX	24	13APR76
78	K2OVS	60	13APR76
79	K2AXQ	50	12NOV76
80	WA3NSR	20	13APR76
81	WB4YFC	32	13APR76
82	W6HEW	60	22OCT76
83	WA4NKN	30	17SEP76
84	WB5MSU	20	10MAY76
85	WB4GZK	20	15MAY76
86	WB5MPU	61	30JAN77
87	WB9MRP	23	15MAY76
88	N4QQ	80	31DEC77
89	WB9RJQ	73	04APR77
90	W6DWJ	20	15MAY76
91	W5VAE	20	20JUN76
92	WA5DYH	20	31MAY76
93	W9OII	60	17JAN77
94	K7CC	40	30AUG76
95	W4EAT	20	15JUN76
96	K7GGY	40	17DEC76
97	P29MJ	10*	03JUL76
98	W2HXF	60	17FEB77
99	OK1DAP	40	03JUL76
100	WA6WTX	20	03JUL76
101	W8OY	20	03JUL76
102	VE3GFM	20	09JUL76
103	K7NEQ	40	09JUL76
104	WA7VDY	21	09JUL76
105	W1JSM	80	07MAR77
106	W1DKU	30	17DEC76
107	SP9ADU	20	22OCT76
108	W4AIT	61	22OCT76
109	VE3EFX	20	22OCT76
110	WA8UUY	22	22OCT76
111	K7DYH	21	17DEC76
112	W6SO	20	12NOV76
113	W1DQJ	42	12NOV76
114	WB0BBR	20	30NOV76
115	W2UZL	60	30AUG77
116	W3GK	23	26JAN77
117	G3ZCZ/W3	23	26JAN77
118	W0II	60	17FEB77
119	VU2UV	$$	07MAR77
120	WA0DXZ	20	04APR77
121	WB0TXA	21	08APR77
122	WB2RBG	20	23MAY77
123	WB7BFK	30	23MAY77
124	WA2LJM	30	10JUN77
125	WA3SOX	21	30JUN77
126	K4EVH	20	30AUG77
127	W7RZY	20	30JUN77
128	JA9BOH	20	30JUN77
129	WA4BUE	20	15JUL77
130	W4RJC	62	15JUL77
131	W0RWC	49	15JUL77
132	W2AAV	20	15JUL77
133	K9RVG	20	30AUG77
134	K2ZRO	90	04NOV77
135	SP9DH	50	04NOV77
136	WB5UER	20	04NOV77
137	W2IBZ	50	04NOV77
138	K9SM	64	25NOV77
139	PA0LQ	60	13DEC77
140	W9MXC	20	13DEC77
141	W4FJ	60	31DEC77

AMSAT GRATEFULLY ACKNOWLEDGES DONATIONS OF $100 OR MORE FROM THE FOLLOWING NEW LIFE MEMBERS

LM-741	K. Baker, VE2XL
LM-742	J. Morgan, W5LQR
LM-743	A. Baldwin, WA0CKD
LM-744	M.M. Marshall, VE6ZR
LM-745	F. Woletz, DL7AD
LM-746	W. Melanson, W1LID
LM-747	E.E. Robinson, III, W5XT/W5YTN
LM-748	D. Tidwell, K4UUW
LM-749	J. Hammack, K5GZ
LM-750	R. Niemtzow, W5VQN
LM-751	M. Woll, WB6VZI
LM-752	J. Flinn, W9SE
LM-753	C.O. Smythies, VE7NP
LM-754	J.A. Lyle, N8JL
LM-755	J. Walsh, WB6ACU
LM-757	E. Reuman, WB4NJA
LM-758	R. Sloate, W7BMI
LM-759	P. Hurd, N1SS/K4NSS
LM-760	B. Smeds, DJ0EX/SM0GJ
LM-761	R. Larruy, EA5KF
LM-763	R.L. Neilson, ZS1RT
LM-764	J. Galin, W1EA
LM-765	W. Pontes de Faria, PY1BDU
LM-766	P. Wallace, W6AM
LM-767	R. Gonsett, WA6QQQ
LM-768	C. Roettcher, K3FLS
LM-769	J. Melvin, WA6SBO
LM-770	E. Ireland, WA6TLE
LM-771	G. Pollard, W5CDM
LM-772	D.H. Phillips, W6FOO
LM-773	M.A. Piroumian, WA6OPB
LM-774	G. Foley, K8EF
LM-775	J.D. Alden, K4HRY
LM-776	C. Dotson, WA6HXU
LM-777	L.W. Scott, W3QDI
LM-778	H.C. van Putten, PA0XVP
LM-779	D. Dunn, W8CQ
LM-780	P.H. Muller, HB9MSM
LM-781	W. Schneider, Jr., K2TT/K2UYJ
LM-782	A. Galin, N1AF
LM-783	L. Matthews, W4YU
LM-784	S. Dworken, WB6DEB
LM-785	K. Patel, 9J2KL
LM-786	J. Gersbacher, WA6UAA
LM-787	B. Weeks, W4UQA
LM-788	C.C. Lane, WA4TNV
LM-789	H. Leake, W6AXX
LM-790	J. Biro, K1KSY
LM-791	P. Yantis, WB0OTH
LM-792	D. Howe, N7AO
LM-793	W. Cooley, WB2YIK
LM-794	J. Malin, WB2LEI
LM-795	T. Pyke, K4DSD
LM-796	J. McDermott, WD5DUD
LM-797	R. Janhunen, OH2HK
LM-798	D. Williamson, K4HVI
LM-799	P.S. Smith, G4BJG
LM-800	W. Muller, PY1BJ
LM-801	W.H. Curry, Jr., W5CQ
LM-802	R. Darcus, VE7ADH
LM-803	F. Kennedy, K2TTI
LM-804	W. McCaa, K0RZ
LM-805	M. Bernard, FG7AO
LM-806	L. Unneberg, SM6GVV
LM-807	D.E. Samek, N.Y.
LM-808	C.H. Topmiller, WD4NLA
LM-809	G. de Buren, HB9AW/WA6QAN
LM-810	R. Brossa, HE9RMH
LM-811	L. del Molino, EA3OG
LM-812	N. Firestone, W3SVJ
LM-813	R. Haxton, WA3IVB
LM-814	R. Cushman, WA1QFY
LM-815	P. Horan, WA2IKO
LM-816	D. Clement, WA1FSZ
LM-817	J. Lyster, K8CDZ
LM-818	J. Alliaume, F5JA
LM-819	Y. Margot, HB9AOF
LM-820	M. Lindsay, VK4HD
LM-821	M. Busch, W2GRD
LM-822	P. DeJarlais, W0JHS/AFW0JHS
LM-823	R. Hulme, VE3DNG
LM-824	P. Graham, K9ERG
LM-825	D. MacKeown, WB4MUV
LM-826	A. Corderman, WB1EFN
LM-827	C. Clark, K4GEX
LM-828	A. Courir, I4AIJ
LM-829	R.L. Dupont, Tex.
LM-830	E. Gaffney, W7FOS
LM-831	P. Kuntz, F6CDK
LM-832	E. Walker, WA6MDJ
LM-833	D. Wilson, WB8ZOS
LM-834	U. Hadorn, HB9ABO
LM-835	D. Curry, W5HVT
LM-836	R. Brandhof, W3QNS
LM-837	J. Buckley, W1HMS
LM-838	J. Bingham, WB4JVZ
LM-839	P. Ferro, W4WAQ
LM-840	T.C. Mann, VE4TX

OSCAR AWARD STATUS (CONTINUED)

142	OH3AWH	20	31DEC77
143	W4NG	20	31DEC77
144	K0IJU	20	31DEC77
145	WA9AHZ	20	31DEC77
DL-ISSUED/DC9DX			
D-01	DL3SX	20	14JAN76
D-02	DL1TV	20	31MAR76
D-03	DL6JP	42	13APR76
D-04	DL2UO	21	14APR76
D-05	DL6ZB	20	20MAY76
D-06	DL2OM	20	20JUN76
D-07	DK4HD	20	06JUL76
D-08	DC9ZP	22	12OCT76
D-09	DC9DX	31	11JAN77
D-10	DL3BL	21	11JAN77
D-11	DC9DX	20	11JAN77
D-12	OZ3GW	43	19FEB77
F-ISSUED/F6BEG			
F-01	F6BEG	40	25OCT76
F-02	F2NB	30	25NOV75
F-03	F6APU	20	05JAN76
F-04	F1JG	40	24JAN77
F-05	F6CER	35	26FEB77
UK-ISSUED/G8KLO			
G-01	G4BBR		
G-02	G4JJ		
G-07	G3FPK		
G-08	G3IOR		
VK-ISSUED/VK5HI			
VK01	VK5HI		
VK02	VK5QR		
VK03	VK5ZAD		
NZ-ISSUED/ZL2GX			

+ = AWARD PENDING
* = RULE (2)
**= RULE (3)

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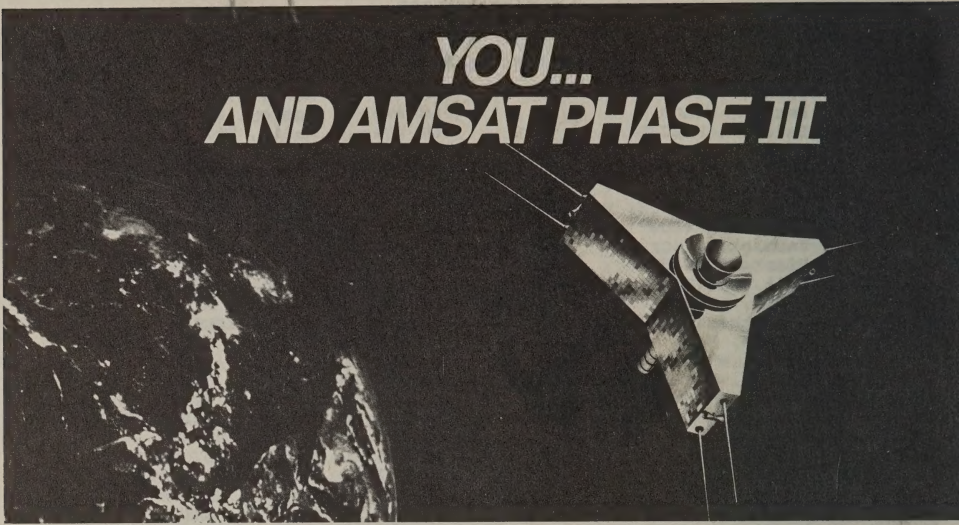
YOU... AND AMSAT PHASE III



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